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IDENTIFIERS Area (Geometry); *Circles; *Circumference; Preapprenticeship Programs

ABSTRACT

One of a series of pre-apprenticeship phase 1 training modules dealing with math skills, this self-paced student module covers circumferences and areas of circles. Included in the module are the following: cover sheet listing module title, goals, and performance indicators; introducation; study guide/check list with directions for module completion; information sheet; self-assessment; self-assessment answers; and post assessment. Emphasis of the module is on problems that are frequently encountered by workers in the skilled trades. (Other related pre-apprenticeship phase 1 training modules are available separately--see note.) (MN)

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INDIVIDUALIZED LEARNING SYSTEMS

PRE-APPRENTICESHIP
PHASE 1 TRAINING

MATH

CIRCUMFERENCE AND AREA OF CIRCLES

CE032928

Goal:

The student will know the necessary math concepts in circumference and area of circles to enable him or her to compute math problems in which these concepts are used.

Performance Indicators:

Given a series of math problems in the Self Assessment and Post Assessment portions of this module, the student will be able to successfully compute the answers.

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Introduction

A knolwedge of the rules and procedures for finding the circumference and area of a circle is important for workers in the skilled trades. A construction worker, for instance, must make computations involving circular areas as well as straight-sided areas when working with structures like circular buildings, silos, or tanks. In a typical problem, he or she might find it necessary to determine the number of feet of insulating material needed for covering a cylindrical hot-water storage tank of a given diameter and height. The first step in solving this problem would be the calculation of the tank's circumference. The present module gives the information needed for finding the area and the circumference of a circle.

Study Guide

This study guide is designed to help you successfully complete this module. Check off the following steps to completion as you finish them.

STEPS TO COMPLETION

1. ____ Familiarize yourself with the Goal and Performance Indicators on the title page of this module.

2. ____ Read the Introduction and study the Information section of the module. It is intended to provide you with the math skills necessary to successfully complete the assessment portions.

3. ____ Complete the Self Assessment section of the module. You may refer to the Information section for help.

4. ____ Compare your Self Assessment answers with the correct answers on the Self Assessment Answer Sheet immediately following the Self Assessment exam. If you missed more than one of the Self Assessment exam questions, go back and re-study the necessary portions of the Information section, or ask your instructor for help. If you missed one or none of these problems, go on to step 5.

5. ____ Complete the Post Assessment section of the module. Show your answers to the instructor. It is recommended that you score 90% or better on those Post Assessment exams with 10 or more problems, or miss no more than one problem on those with fewer than 10 problems, before being allowed to go on to the next math module.

Information

FINDING THE CIRCUMFERENCE OF A CIRCLE

The perimeter of an object has been definded as the distance around it; circumference is the term employed for the perimeter of a circle or circular object. Any continuous part of a circumference is called an arc. The diameter of a circle is a straight line passing through the center of the circle and terminating at the circumference. The radius of a circle is a straight line drawn from the center of the circle to any point on the circumference; it is therefore equal to one-half the diameter. (See Fig. D-9).

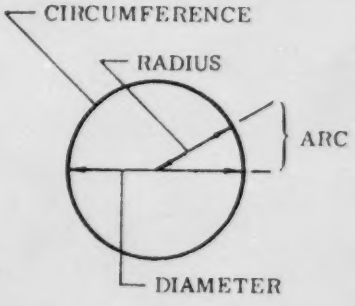


Fig. D-9. Basic parts of a circle.

Regardless of the size of the circle, its circumference bears a constant relationship to its diameter. This ratio is 3.1416 to 1, or roughly 3 1/7 to 1. The number 3.1416 is a "constant" in mathematics; it has been given the symbol π (the Greek letter "pi"). If the diameter of a circle is known, the circumference can be computed by the following rule: Circumference = π x diameter (or, in short form, $C = \pi \times D$).

The following example shows how the rule would be put to work in solving a practical problem:

Problem: Find the circumference of a circle whose radius is 10 feet.

Rule: $C = \pi \times D$

Step 1: Find the diameter
$D = 2 \times$ Radius (R)
$2 \times R = 20'$

Step 2: Multiply the diameter by π
$20' \times 3.1416$

Answer: $C = 62.832'$

By applying the rule for the circumference of a circle in another way, we can find the diameter or the radius of a circle if only the circumference is known. Since $C = \pi \times D$, it is also true that $D = C \div \pi$. The steps to be followed in solving a typical problem of this type are shown below:

Problem: Find the radius of a circle whose circumference is 34 inches.

Step 1: Find the diameter
$D = C \div \pi$, so $D = 34" \div 3.1416$, or $10.82"$

Step 2: Find the radius
$R = 1/2\ D$
$R = 10.82' \div 2$

Answer: $R = 5.41$

FINDING THE AREA OF A CIRCLE

To find the area of a circle, multiply the radius by itself, then multiply the resulting product by 3.1416 (π). The result, of course, will be in square measure. A number multiplied by itself is said to be squared; the symbol for squaring is a 2 following and slightly above the number to be squared. Thus 5^2 means 5×5, or 5 squared. The rule for finding the area of a circle, then, is: Area $= \pi \times R^2$. The application of this rule is illustrated in the following problem:

Problem: Find the area (A) of a circle whose radius is 20 feet.

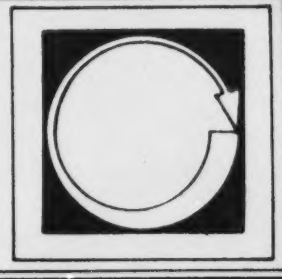
Rule: $A = \pi \times R^2$

Step 1: Find the square of the radius.
$R^2 = 20' \times 20' = 400$ sq. ft.

Step 2: Multiply R^2 by π
3.1416×400 sq. ft.

Answer: $A = 1256.64$ sq. ft.

Self Assessment



Determine the word that belongs in each blank and write the word in.

1. The distance around the rim of a wheel is called the _____ of the wheel.

2. The diameter of a circle is a line passing through the _____ of the circle and terminating at the _____.

3. The symbol π, which is the Greek letter _____, stands for a mathematical constant having the numberical value _____.

4. The circumference of a circle is equal to π times the circle's _____.

5. The _____ of a circle is equal to one-half the circle's diameter.

6. The area of a circle is found by the following formula: $A = \pi$ x ____.

7. The area of a circle is given in units of _____ measure.

8. If the radius of a circle is 5 inches, the circumference of the circle is _____ inches.

9. If the circumference of a circle is 95 inches, the diameter of the circle is _____ (to the nearest inch).

10. The area of a circle having a radius of 10 inches is _____.

Self Assessment Answers

1. circumference
2. center, edges
3. pi, 3.1416
4. diameter
5. radius
6. radius squared or R^2
7. square
8. 31.14 inches
9. 30 inches
10. 314 sq. inches

Post Assessment

Listed below each problem are four possible answers. Decide which of the four is correct, or most nearly correct; then write the letter for that answer in the blank space to the left of the problem.

1. ____ The circumference of a hole 14" in diameter is how many inches?

   a. 43.98+ c. 58.39+
   b. 49.38+ d. 59.98+

2. ____ What is the area in square inches of a circular vent hole 30" in diameter?

   a. 607.58+ c. 807.58+
   b. 706.860 d. 857.850

3. ____ The area of a circular ceiling with a radius of 12' is how many square feet?

   a. 425.930 c. 493.390
   b. 452.39+ d. 857.850

4. ____ The area of a circular putting green with a radius of 17' is how many square feet?

   a. 907.92+ c. 1,002.720
   b. 909.72+ d. 1,007.92+

5. ____ A pole-hole in the second-story floor of a firehouse has a radius of 22". What is its circumference in inches?

   a. 123.230 c. 138.23+
   b. 132.32+ d. 148.320

6. ____ The area of a circular swimming pool with a radius of 10' is how many square feet?

   a. 304.16+ c. 341.46+
   b. 314.16+ d. 364.16+

7. ____ The area of a circular skating rink with a radius of 40' is how many square feet?

   a. 5,026.56+ c. 5,206.560
   b. 5,062.650 d. 5,506.26+

8. ____ A merry-go-round at an amusement park has a radius of 33'. What is its circumference in feet?

a. 179.04+
b. 197.34+
c. 206.34+
d. 237.04+

9. ____ A water tank has a diameter of 8'6". What is its circumference in feet?

a. 20.70
b. 23.33+
c. 25.250
d. 26.70+

10. ____ What is the area of a circular floor with a diameter of 10'6", to the nearest square foot?

a. 85
b. 86
c. 87
d. 88